Remarks

Thorough examination by the Examiner is noted and appreciated.

Claims 1, 10, 18, 23, 46, and 47 have been amended to correct grammatical errors.

No new matter has been added.

Claim Rejections under 35 USC 103(a)

Claims 1-29 stand rejected under 35 USC Section 103(a) as being unpatentable over Lin et al. (US 6,342,448) in view of Chung et al. (USPUB 2003/0057526).

Statement of Common Ownership Pursuant to 35 USC 103(c)

Applicants attorney of record state that Lin et al. (US 6,342,448) and Applicants instant application were, at the time the invention was made, owned by Taiwan Semiconductor Manufacturing Company. Therefore, Examiners use of Lin et al. as

a reference in a 103(a) rejection appears to be improper under 35 USC §103(C).

However, while not agreeing Lin et al. may be properly be used as a reference in a rejection under 103(a), assuming *arguendo* that it is a properly used reference, Applicants respectfully traverse Examiner's rejection under 35 U.S.C. 103(a).

Lin et al. disclose a method for forming an improved TaN barrier layer. Lin et al. disclose forming a first Ta layer followed by a middle TaN layer followed by an upper Ta layer (see Abstract). Lin et al. teach that the upper Ta layer (18 to 22 Angstroms thick) improves wetting of an overlying copper seed layer (see e.g., col 9, lines 8-25).

Thus, Lin et al. do not disclose several aspects of Applicants disclosed and claimed invention.

Nowhere do Lin et al. disclose or suggest plasma treating a seed layer.

Nowhere do Lin et al. disclose forming a first and second

seed layer on a diffusion barrier layer.

Lin et al. disclose and teach a **single copper seed layer on the composite barrier layer** (with the copper seed layer being 1200 to 2500 Angstroms thick) (col 9, lines 13-20).

In any event, nowhere do Lin et al. disclose or suggest:

"forming a diffusion barrier layer to line the damascene opening;

then forming a first seed layer on the diffusion barrier;

then plasma treating the first seed layer in-situ with a first treatment plasma **consisting essentially of** plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and NH_3;

then forming a second seed layer on the first seed layer;"

On the other hand, Chung et al. discloses a method of forming a barrier layer with a **first copper alloy seed layer** and

a **second undoped copper seed layer** to improve adhesion of a copper seed layer to a barrier layer and prevent dewetting of the copper seed layer by agglomeration in subsequent thermal processes (see Abstract; col 1, paragraph 008; paragraph 0059; paragraph 0061; paragraphs 0068-0070; claims 1, 8, an 17)

Contrary to Examiners assertion, nowhere do Chung et al. disclose or suggest **plasma treating** the first seed layer **following formation** of the first seed layer and **prior to formation** of the second seed layer as Applicants have disclosed and claimed. Rather, Chung et al. disclose plasma annealing a **TaN barrier layer prior to depositing a seed layer** (see paragraph 0047). Examiner is also apparently mistakenly equating Applicants disclosed and claimed **plasma treatment following the first seed layer formation** with the PVD seed layer deposition process (using argon -see paragraph 0054) disclosed for forming a seed layer (see paragraphs 0049-0053, 0065).

Thus, even assuming *arguendo*, proper use of Lin et al. as a reference and a proper motivation to combine the teachings of the references, which Applicants do not concede, such combination does not produce Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

Conclusion

Since the combination of Lin et al. and Chung et al. is improper, and nevertheless fail to produce Applicants disclosed and claimed invention or make out a *prima facie* case of obviousness with respect to Applicants independent claims, neither has a *prima facie* case of obviousness been made out with respect to Applicants dependent claims.

Based on the foregoing, Applicants respectfully submit that all of the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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